7206 VXR NPE-G1 Router with Single VPN Acceleration Module 2 (VAM2) and Dual VPN Acceleration Module 2 (VAM2)

FIPS 140-2
Non-Proprietary Security Policy

Level 2 Validation
Version 1.4

April 29, 2004

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Introduction

Purpose

This is a non-proprietary Cryptographic Module Security Policy for Cisco Systems. This security policy describes how the 7206 VXR NPE-G1 Router with Single VPN Acceleration Module 2 (VAM2) and Dual VPN Acceleration Module 2 (VAM2) (Hardware Version: 7206 VXR; NPE-G1: Hardware Version 1.1, Fab Version 05; VAM2: Hardware Version 2.0, Board Version A0; Firmware Version: IOS 12.3(3d)) meets the security requirements of FIPS 140-2 and how to run the module in a secure FIPS 140-2 mode. This policy was prepared as part of the Level 2 FIPS 140-2 validation of the module.

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FIPS 140-2 (Federal Information Processing Standards Publication 140-2 — *Security Requirements for Cryptographic Modules*) details the U.S. Government requirements for cryptographic modules. More information about the FIPS 140-2 standard and validation program is available on the National Institute of Standards and Technology (NIST) website at http://csrc.nist.gov/cryptval/.

References

This document deals only with operations and capabilities of the module in the technical terms of a FIPS 140-2 cryptographic module security policy. More information is available on the module from the following sources:

- The Cisco Systems, Inc. website (www.cisco.com) contains information on the full line of products from Cisco Systems, Inc.
- The NIST Validated Modules website (http://csrc.ncsl.nist.gov/cryptval/): contains contact information for answers to technical or sales-related questions for the module

Document Organization

The Security Policy document is one document in the FIPS 140-2 Submission Package. In addition to this document, the Submission Package contains:

- Vendor Evidence document
- Finite State Machine
- Other supporting documentation as additional references

With the exception of this Non-Proprietary Security Policy, the FIPS 140-2 Validation Submission Documentation is proprietary to Cisco Systems, Inc. and is releasable only under appropriate non-disclosure agreements. For access to these documents, please contact Cisco Systems, Inc.

CISCO 7206 VXR NPE-G1 WITH VAM2

Overview

Cisco 7206 VXR routers are designed to support gigabit capabilities and to improve data, voice, and video integration in both service provider and enterprise environments. Cisco 7206 VXR routers support a high-speed network services engine (NSE) as well as the high-speed network processing engine, NPE-G1, and all other available network processing engines.

Cisco 7206 VXR routers accommodate a variety of network interface port adapters and an Input/Output (I/O) controller. A Cisco 7206 VXR router equipped with an NPE-G1 can support up to six high-speed port adapters and can also support higher-speed port adapter interfaces including Gigabit Ethernet and OC-12 ATM (Optical Carrier-12 Asynchronous Transfer Mode). Cisco 7206 VXR routers also contain bays for up to two AC-input or DC-input power supplies.

Cisco 7206 VXR routers support the following features:

- Online insertion and removal (OIR)—Add, replace, or remove port adapters without interrupting the system.
- Dual hot-swappable, load-sharing power supplies—Provide system power redundancy; if one power supply or power source fails, the other power supply maintains system power without interruption. Also, when one power supply is powered off and removed from the router, the second power supply immediately takes over the router power requirements without interrupting normal operation of the router.
- Environmental monitoring and reporting functions—Maintain normal system operation by resolving adverse environmental conditions prior to loss of operation.
- Downloadable software—Load new images into Flash memory remotely, without having to physically access the router.

The Cisco 7206 VXR router incorporates either one or two VPN Acceleration Module 2 (VAM2) cryptographic accelerator cards. The VAM2s are installed in port adapter slots. The VPN Acceleration Module 2 (VAM2) is a single-width acceleration module that provides high-performance, hardware-assisted tunneling and encryption services suitable for virtual private network (VPN) remote access, site-to-site intranet, and extranet applications. It also provides platform

scalability and security while working with all services necessary for successful VPN deployments—security, quality of service (QoS), firewall and intrusion detection, and service-level validation and management. The VAM2 off-loads IPSec processing from the main processor, thus freeing resources on the processor engines for other tasks.

Cryptographic Module

The 7206 VXR NPE-G1 Router with Single VPN Acceleration Module 2 (VAM2) and Dual VPN Acceleration Module 2 (VAM2) supports multi-protocol routing and bridging with a wide variety of protocols and port adapter combinations available for Cisco 7200 series routers. The metal casing that fully encloses the module establishes the cryptographic boundary for the router, all the functionality discussed in this document is provided by components within the casing. The Cisco 7206VXR has six slots for port adapters, one slot for an I/O controller, and one slot for a network processing engine or network services engine. The router with single and dual VAM2 is a multi-chip standalone cryptographic module.

The following defines the configuration tested for the Cisco 7206VXR:

- 7206 VXR chassis
- Network Processing Engine (NPE-G1)
- VAM2 hardware acceleration card (single and dual)
- One power supply

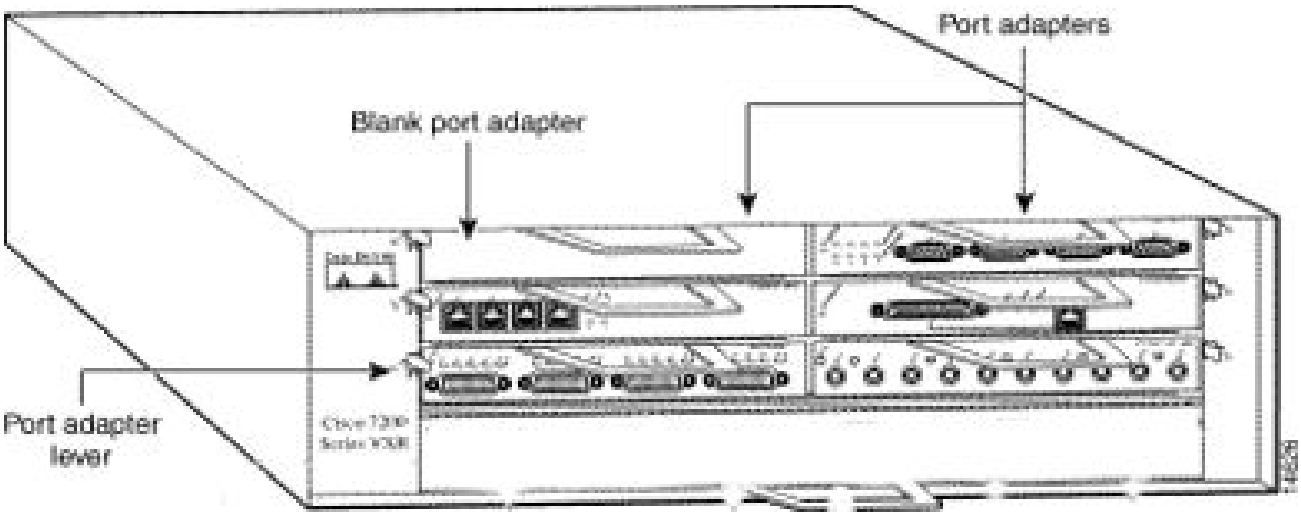


Figure 1 - The 7206 VXR NPE-G1 Router

The NPE-G1 uses an RM7000 microprocessor that operates at an internal clock speed of 350 MHz. The NPE-G1 uses SDRAM for storing all packets received or sent from network interfaces. The SDRAM memory array in the system allows concurrent access by port adapters and the processor. The NPE-G1 has three levels of cache: a primary and a secondary cache that are internal to the microprocessor, and a tertiary 4-MB external cache that provides additional high-speed storage for data and instructions.

The Cisco 7206VXR router comes equipped with one 280W AC-input power supply. A 280W DC -input power supply option is available. A power supply filler plate is installed over the second power supply bay. A fully configured Cisco 7206VXR router operates with only one installed power supply; however, a second, optional power supply of the same type provides hot-swappable, load-sharing, redundant power.

Module Interfaces

The interfaces for the router are located on the rear panel. The module has three interfaces, each with 2 ports: 1 Fast Ethernet/Gigabit (10/100/1000 RJ-45) connector and 1 Gigabit Ethernet port; only one of these 2 ports can be active for each interface. The module also has a compact flash interface, reset switch, and two other RJ-45 connectors for a console terminal for local system access and an auxiliary port for remote system access or dial backup using a modem.

The figure below shows the rear panel LEDs (light emitting diodes), which provide overall status of the router operation. The rear panel displays whether or not the router is booted, if the redundant power is attached and operational, and overall activity/link status.

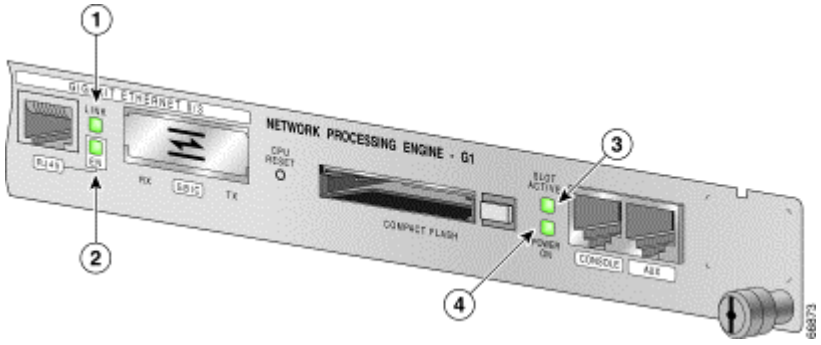


Figure 2 – Rear Panel LEDs

LED	Indication	Description
Enabled	Green	The NPE-G1 faceplate contains LEDs that indicate system and port status. The RJ-45 and GBIC ports share the same LINK LED because only one of these ports per interface (0/1, 0/2, or 0/3) can be used at any one time. The EN (enable) LED is on if the RJ-45 port is in use.
	Off	No traffic is being passed
EN (Enable	Green	The RJ-45 port is active
	Off	The Gigabit Ethernet port is active
Slot Active	Green	Compact flash interface is active
	Off	The compact flash interface is inactive
Power On	Green	The POWER ON LED is on whether or not an I/O controller is present in the router. The compact Flash Disk slot can be used whether or not an I/O controller is present in the router. The SLOT ACTIVE LED is on only when the compact Flash Disk slot is in use.
	Off	The module is not powered on

Table 1 – Rear Panel LEDs and Descriptions

The VAM2 has three LEDs, as shown below. Table 2 lists the colors and functions of the VAM2 LEDs.

Figure 3 – VAM2 LEDs

LED Label	Color	State	Function
ENABLE	Green	On	Indicates the VAM2 is powered up and enabled for operation.
BOOT	Amber	Pulses	Indicates the VAM2 is operating.
		On	Indicates the VAM2 is booting or a packet is being encrypted or decrypted.
ERROR	Amber	On	Indicates an encryption error has occurred. This LED is normally off.

Table 2 – VAM2 LEDs and Descriptions

All of these physical interfaces are separated into the logical interfaces from FIPS as described in the following table:

Router Physical Interface	FIPS 140-2 Logical Interface
10/100/1000 BASE-TX LAN Port Gigabit Ethernet Port Port Adapter Interface Console Port Auxiliary Port PCMCIA Slot	Data Input Interface
10/100/1000 BASE-TX LAN Port Gigabit Ethernet Port Port Adapter Interface Console Port Auxiliary Port PCMCIA Slot	Data Output Interface
10/100/1000 BASE-TX LAN Port Gigabit Ethernet Port Power Switch Reset Switch Console Port Auxiliary Port	Control Input Interface
10/100/1000BASE-TX LAN Port LEDs Gigabit Ethernet Port Enabled LED PCMCIA LEDs IO Pwr Ok LED VAM2 LEDs Console Port Auxiliary Port	Status Output Interface
Power Plug	Power Interface

Table 3 – FIPS 140-2 Logical Interfaces

In addition to the built-in interfaces, the router also has additional port adapters that can optionally be placed in an available slot. These port adapters have many embodiments, including multiple Ethernet, token ring, and modem cards to handle frame relay, ATM, and ISDN (Integrated Services Digital Network) connections.

(Note: These additional port adapters were excluded from this FIPS 140-2 Validation.)

Roles and Services

Authentication is role-based. There are two main roles in the router that operators may assume: the Crypto Officer role and the User role. The administrator of the router assumes the Crypto Officer role in order to configure and maintain the router using Crypto Officer services, while the Users exercise only the basic User services. Both roles are authenticated by providing a valid username and password. The configuration of the encryption and decryption functionality is performed only by the Crypto Officer after authentication to the Crypto Officer role by providing a valid Crypto Officer username and password. Once the Crypto Officer configured the encryption and decryption functionality, the User can use this functionality after authentication to the User role by providing a valid User username and password. The Crypto Officer can also use the encryption and decryption functionality after authentication to the Crypto Officer role. The module supports RADIUS and TACACS+ for authentication and they are used in the FIPS mode. A complete description of all the management and configuration capabilities of the Cisco 7206 Router can be found in the *Performing Basic System Management* manual and in the online help for the router.

The User and Crypto Officer passwords and the RADIUS/TACACS+ shared secrets must each be at least 8 alphanumeric characters in length. See the *Secure Operation* section for more information. If only integers 0-9 are used without repetition for an 8 digit PIN, the probability of randomly guessing the correct sequence is 1 in 1,814,400. Including the rest of the alphanumeric characters drastically decreases the odds of guessing the correct sequence.

CRYPTO OFFICER ROLE

During initial configuration of the router, the Crypto Officer password (the “enable” password) is defined. A Crypto Officer may assign permission to access the Crypto Officer role to additional accounts, thereby creating additional Crypto Officers.

The Crypto Officer role is responsible for the configuration and maintenance of the router. The Crypto Officer services consist of the following:

- **Configure the router**: define network interfaces and settings, create command aliases, set the protocols the router will

support, enable interfaces and network services, set system date and time, and load authentication information.

- **Define Rules and Filters**: create packet Filters that are applied to User data streams on each interface. Each Filter consists of a set of Rules, which define a set of packets to permit or deny based characteristics such as protocol ID, addresses, ports, TCP connection establishment, or packet direction.

- **Status Functions**: view the router configuration, routing tables, active sessions, use Gets to view SNMP MIB II statistics, health, temperature, memory status, voltage, packet statistics, review accounting logs, and view physical interface status

- **Manage the router**: log off users, shutdown or reload the router, manually back up router configurations, view complete configurations, manager user rights, and restore router configurations.

- **Set Encryption/Bypass**: set up the configuration tables for IP tunneling. Set keys and algorithms to be used for each IP range or allow plaintext packets to be set from specified IP address.

- **Change Port Adapters**: insert and remove adapters in a port adapter slot.

User Role

A User enters the system by accessing the console port with a terminal program. The IOS prompts the User for their password. If the password is correct, the User is allowed entry to the IOS executive program. The services available to the User role consist of the following:

- **Status Functions**: view state of interfaces, state of layer 2 protocols, version of IOS currently running

- **Network Functions**: connect to other network devices (via outgoing telnet or PPP) and initiate diagnostic network services (*i.e.*, ping, mtrace)

- **Terminal Functions:** adjust the terminal session (e.g., lock the terminal, adjust flow control)

- **Directory Services**: display directory of files kept in flash memory

Physical Security

The router is entirely encased by a thick steel chassis. The front of the router provides 6 port adapter slots, and the rear of the router provides on-board LAN connectors, PC Card slots, and Console/Auxiliary connectors. The power cable connection, a power switch, and the access to the Network Processing Engine are at the rear of the router.

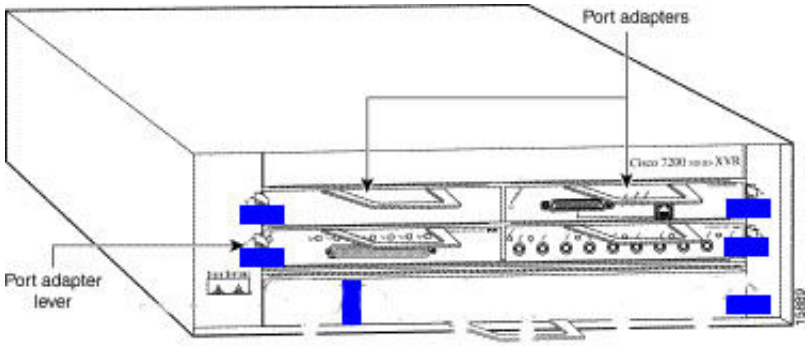
Any Port Adapter slot, which is not populated with a Port Adapter, must be populated with an appropriate slot cover in order to operate in a FIPS compliant mode. The slot covers are included with each router, and additional covers may be ordered from Cisco. The same procedure mentioned below to apply tamper evidence labels for Port Adapters must also be followed to apply tamper evidence labels for the slot covers.

Once the router has been configured to meet FIPS 140-2 Level 2 requirements, the router cannot be accessed without signs of tampering. The word “OPEN” may appear on the label if it was peeled away from the surface of the module. The Crypto Officer should be instructed to record serial numbers, and to inspect for these signs of tampering or changed numbers periodically.

To seal the system, apply serialized tamper-evidence labels as depicted in Figure 4, below and as follows:

- Clean the cover of any grease, dirt, or oil before applying the tamper evidence labels. Alcohol-based cleaning pads are recommended for this purpose. The ambient air must be above 10C, otherwise the labels may not properly cure.
- A tamper evidence label should be placed so that the one half of the label covers the enclosure and the other half covers the NPE-G1.
- A tamper evidence label should be placed over the Flash PC Card slot on the NPE-G1.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the port adapter slot 1.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the port adapter slot 2.

- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the port adapter slot 3.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the port adapter slot 4.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the port adapter slot 5.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the port adapter slot 6.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the I/O Controller blank face plate.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the power supply plate.
- A tamper evidence label should be placed so that one half of the label covers the enclosure and the other half covers the redundant power supply plate.
- Allow the labels to cure for five minutes.



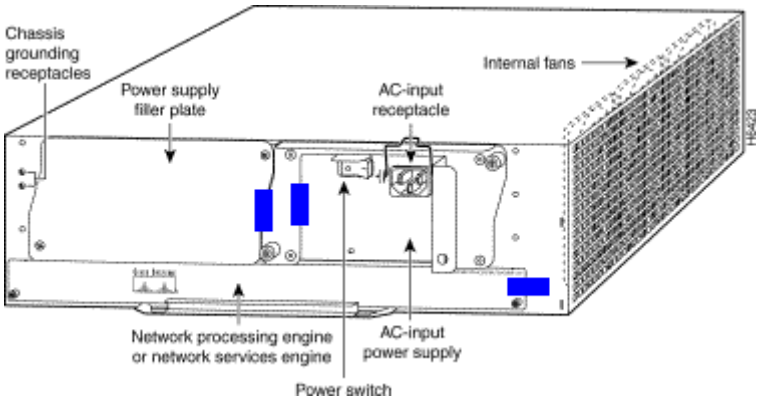


Figure 4 – Tamper Evidence Label Placement

Cryptographic Key Management

The IOS software implementations of the FIPS algorithms have the following FIPS algorithm certifications:

- DES (certificate #202)
- 3DES (certificate #156)
- AES (certificate #46)
- SHA-1 (certificate #26)
- SHA-1 HMAC (vendor affirmed)

The VAM2 firmware implementations of the FIPS algorithms have the following FIPS algorithm certifications:

- DES (certificate #204)
- 3DES (certificate #158)
- AES (certificate #48)
- SHA-1 (certificate #143)
- SHA-1 HMAC (vendor affirmed)

The router securely administers both cryptographic keys and other critical security parameters such as passwords. The tamper evidence seals provide physical protection for all keys stored within the module. All keys are also protected by the password-protection on the Crypto Officer role login, and can be zeroized by the Crypto Officer. Keys are exchanged manually and entered electronically via manual key

exchange methods or Internet Key Exchange (IKE) as described below.

The modules contain a cryptographic accelerator card (the VAM2), which provides AES, DES (56-bit) (only for legacy systems), and 3DES (168-bit) IPSec encryption, MD5 and SHA-1 hashing, HMAC-SHA-1, RSA (sign and verify), and has hardware support for Diffie-Hellman (DH) and RSA key generation.

The module supports the following critical security parameters (CSPs):

#	CSP Name	Description	Storage
1	CSP 1	This is the seed key for X9.31 PRNG. This key is stored in DRAM and updated periodically after the generation of 400 bytes; hence, it is zeroized periodically. Also, the operator can turn off the router to zeroize this key.	DRAM (plaintext)
2	CSP 2	The private exponent used in Diffie-Hellman (DH) exchange. Zeroized after DH shared secret has been generated.	DRAM (plaintext)
3	CSP 3	The shared secret within IKE exchange. Zeroized when IKE session is terminated.	DRAM (plaintext)
4	CSP 4	Same as above	DRAM (plaintext)
5	CSP 5	Same as above	DRAM (plaintext)
6	CSP 6	Same as above	DRAM (plaintext)
7	CSP 7	The IKE session encrypt key. The zeroization is the same as above.	DRAM (plaintext)
8	CSP 8	The IKE session authentication key. The zeroization is the same as above.	DRAM (plaintext)
9	CSP 9	The RSA private key. “crypto key zeroize” command zeroizes this key.	NVRAM (plaintext)
10	CSP 10	The key used to generate IKE skeyid during preshared-key authentication. “no crypto isakmp key” command zeroizes it. This key can have two forms based on whether the key is related to the hostname or the IP address.	NVRAM (plaintext)
11	CSP 11	This key generates keys 3, 4, 5 and 6. This key is zeroized after generating those keys.	DRAM (plaintext)
12	CSP 12	The RSA public key used to validate signatures within IKE. These keys are expired either when CRL (certificate revocation list) expires or 5 secs	DRAM (plaintext)

		after if no CRL exists. After above expiration happens and before a new public key structure is created this key is deleted. This key does not need to be zeroized because it is a public key; however, it is zeroized as mentioned here.	
13	CSP 13	The fixed key used in Cisco vendor ID generation. This key is embedded in the module binary image and can be deleted by erasing the Flash.	NVRAM (plaintext)
14	CSP 14	The IPSec encryption key. Zeroized when IPSec session is terminated.	DRAM (plaintext)
15	CSP 15	The IPSec authentication key. The zeroization is the same as above.	DRAM (plaintext)
16	CSP 16	The RSA public key of the CA. “no crypto ca trust <label>” command invalidates the key and it frees the public key label which in essence prevent use of the key. This key does not need to be zeroized because it is a public key.	NVRAM (plaintext)
17	CSP 17	This key is a public key of the DNS server. Zeroized using the same mechanism as above. “no crypto ca trust <label>” command invalidate the DNS server’s public key and it frees the public key label which in essence prevent use of that key. This label is different from the label in the above key. This key does not need to be zeroized because it is a public key.	NVRAM (plaintext)
18	CSP 18	The SSL session key. Zeroized when the SSL connection is terminated.	DRAM (plaintext)
19	CSP 19	The ARAP key that is hardcoded in the module binary image. This key can be deleted by erasing the Flash.	Flash (plaintext)
20	CSP 20	This is an ARAP user password used as an authentication key. A function uses this key in a DES algorithm for authentication.	DRAM (plaintext)
21	CSP 21	The key used to encrypt values of the configuration file. This key is zeroized when the “no key config-key” is issued.	NVRAM (plaintext)
22	CSP 22	This key is used by the router to authenticate itself to the peer. The router itself gets the password (that is used as this key) from the AAA server and sends it onto the peer. The password retrieved from the AAA server is zeroized upon completion of the authentication attempt.	DRAM (plaintext)
23	CSP 23	The RSA public key used in SSH. Zeroized after the termination of the SSH session. This key does not need to be zeroized because it is a public key; However, it is zeroized as mentioned	DRAM (plaintext)

		here.	
24	CSP 24	The authentication key used in PPP. This key is in the DRAM and not zeroized at runtime. One can turn off the router to zeroize this key because it is stored in DRAM.	DRAM (plaintext)
25	CSP 25	This key is used by the router to authenticate itself to the peer. The key is identical to #22 except that it is retrieved from the local database (on the router itself). Issuing the “no username password” zeroizes the password (that is used as this key) from the local database.	NVRAM (plaintext)
26	CSP 26	This is the SSH session key. It is zeroized when the SSH session is terminated.	DRAM (plaintext)
27	CSP 27	The password of the User role. This password is zeroized by overwriting it with a new password.	NVRAM (plaintext)
28	CSP 28	The plaintext password of the CO role. This password is zeroized by overwriting it with a new password.	NVRAM (plaintext)
29	CSP 29	The ciphertext password of the CO role. However, the algorithm used to encrypt this password is not FIPS approved. Therefore, this password is considered plaintext for FIPS purposes. This password is zeroized by overwriting it with a new password.	NVRAM (plaintext)
30	CSP 30	The RADIUS shared secret. This shared secret is zeroized by executing the “no” form of the RADIUS shared secret set command.	NVRAM (plaintext), DRAM (plaintext)
31	CSP 31	The TACACS+ shared secret. This shared secret is zeroized by executing the “no” form of the TACACS+ shared secret set command.	NVRAM (plaintext), DRAM (plaintext)
32	CSP 32	The keys and CSPs above from no. 1 to 31 are located in the router outside from VAM2. However, the CSP 32 object is located in the RAM of the VAM2. All key objects of the VAM2 are built upon the CSP 32 object. The destructor of the CSP 32 object uses memset function to overwrite all bytes of the object to 0x00.	DRAM of VAM2 (plaintext)

Table 4 – Critical Security Parameters

The services accessing the CSPs, the type of access and which role accesses the CSPs are listed in the Table 5.

SRDI/Role/Service Access Policy	Security Relevant Data Item	CSP 1	CSP 2	CSP 3	CSP 4	CSP 5	CSP 6	CSP 7	CSP 8	CSP 9	CSP 10	CSP 11	CSP 12	CSP 13	CSP 14	CSP 15	CSP 16	CSP 17	CSP 18	CSP 19	CSP 20	CSP 21	CSP 22	CSP 23	CSP 24	CSP 25	CSP 26	CSP 27	CSP 28	CSP 29	CSP 30	CSP 31	CSP 32
Role/Service																																	
User role																																	
Status Functions																																	
Network Functions		r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r	r		r	r	r	r	r	r					
Terminal Functions																																	
Directory Services																																	
Crypto-Officer Role																																	
Configure the Router														rwd						rwd		rwd				rwd							
Define Rules and Filters																																	
Status Functions																																	
Manage the Router		d																			rwd	rwd	rwd		d			rwd	rwd	rwd	rwd	rwd	rwd
Set Encryption/Bypass		rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd	rwd		rwd	rwd	rw	rwd	rwd					rwd	rw		rwd						
Change Port Adapters																																	

Table 5 – Role and Service Access to CSPs

The module supports DES (only for legacy systems), DES-MAC, 3DES, 3DES-MAC, SHA-1, MD-5, MD-4, HMAC-SHA-1, HMAC-MD5, Diffie-Hellman, RSA (for digital signatures and encryption (for IKE authentication)), and AES cryptographic algorithms. The MD-5, HMAC-MD5, and MD-4 algorithms are disabled when operating in FIPS mode.

The module supports three types of key management schemes:

1. Manual key exchange method that is symmetric. DES/3DES/AES key and HMAC-SHA-1 key are exchanged manually and entered electronically.

2. Internet Key Exchange method with support for exchanging pre-shared keys manually and entering electronically.

    - The pre-shared keys are used with Diffie-Hellman key agreement technique to derive DES, 3DES or AES keys.

    - The pre-shared key is also used to derive HMAC-SHA-1 key.

3. Internet Key Exchange with RSA-signature authentication.

All pre-shared keys are associated with the CO role that created the keys, and the CO role is protected by a password. Therefore, the CO password is associated with all the pre-shared keys. The Crypto Officer needs to be authenticated to store keys. All Diffie-Hellman (DH) keys agreed upon for individual tunnels are directly associated with that specific tunnel only via the IKE protocol.

Key Zeroization:

All of the keys and CSPs of the module can be zeroized. Please refer to the Description column of Table 4 for information on methods to zeroize each key and CSP.

Self-Tests

In order to prevent any secure data from being released, it is important to test the cryptographic components of a security module to insure all components are functioning correctly. The router includes an array of self-tests that are run during startup and periodically during operations. If any of the self-tests fail, the router transitions into an error state. Within the error state, all secure data transmission is halted and the router outputs status information indicating the failure.

Self-tests performed by the IOS image:

Power-up tests

- Firmware integrity test
- RSA signature KAT (both signature and verification)
- DES KAT
- TDES KAT
- AES KAT
- SHA-1 KAT
- PRNG KAT
- Power-up bypass test
- Diffie-Hellman self-test
- HMAC-SHA-1 KAT

Conditional tests

- Conditional bypass test
- Pairwise consistency test on RSA signature
- Continuous random number generator tests

Self-tests performed by the VAM2 (cryptographic accelerator):

Power-up tests

- Firmware integrity test
- RSA signature KAT (both signature and verification)
- DES KAT
- TDES KAT
- AES KAT
- SHA-1 KAT
- HMAC-SHA-1 KAT
- PRNG KAT

Conditional tests

- Pairwise consistency test on RSA signature
- Continuous random number generator test

SECURE OPERATION

The 7206 VXR NPE-G1 Router with Single VPN Acceleration Module 2 (VAM2) and Dual VPN Acceleration Module 2 (VAM2) meets all the Level 2 requirements for FIPS 140-2. Follow the setting instructions provided below to place the module in FIPS mode of operation. Operating this router without maintaining the following settings will remove the module from the FIPS approved mode of operation.

Initial Setup

1. The Crypto Officer must ensure that the VAM2 cryptographic accelerator card is installed in the module by visually confirming the presence of the VAM2 in a port adapter slot.

2. The Crypto Officer must apply tamper evidence labels as described in the Physical Security section of this document.

3. Only a Crypto Officer may add and remove port adapters. When removing the tamper evidence label, the Crypto Officer should remove the entire label from the router and clean the cover of any grease, dirt, or oil with an alcohol-based cleaning pad. The Crypto Officer must re-apply tamper evidence labels on the router as described in the Physical Security section of this document.

System Initialization and Configuration

1. The Crypto Officer must perform the initial configuration. The IOS version 12.3(3d) is the only allowable image. No other image may be loaded.

2. The value of the boot field must be 0x0101 (the factory default). This setting disables break from the console to the ROM monitor and automatically boots the IOS image. From the “configure terminal” command line, the Crypto Officer enters the following syntax:

```
config-register 0x0101
```

3. The Crypto Officer must create the “enable” password for the Crypto Officer role. The password must be at least 8 characters and is entered when the Crypto Officer first engages the “enable” command. The Crypto Officer enters the following syntax at the “#” prompt:

```
enable secret [PASSWORD]
```

4. The Crypto Officer must always assign passwords (of at least 8 characters) to users. Identification and authentication on the console port is required for Users. From the “configure terminal” command line, the Crypto Officer enters the following syntax:

```
line con 0

password [PASSWORD]

login local
```

5. The Crypto Officer shall only assign users to a privilege level 1 (the default).

6. The Crypto Officer shall not assign a command to any privilege level other than its default.

7. The Crypto Officer may configure the module to use RADIUS or TACACS+ for authentication. Configuring the module to use RADIUS or TACACS+ for authentication is optional. If the module is configured to use RADIUS or TACACS+, the Crypto-Officer must define RADIUS or TACACS+ shared secret keys that are at least 8 characters long.

8. If the Crypto Officer loads any IOS image onto the router, this will put the router into a non-FIPS mode of operation.

9. The I/O controller is not allowed in FIPS mode and should not be installed in the module.

IPSec Requirements and Cryptographic Algorithms

There are two types of key management method that are allowed in FIPS mode: Internet Key Exchange (IKE) and IPSec manually entered keys.

Although the IOS implementation of IKE allows a number of algorithms, only the following algorithms are allowed in a FIPS 140-2 configuration:

- ah-sha-hmac
- esp-des
- esp-sha-hmac
- esp-3des
- esp-aes

The following algorithms are not FIPS approved and should be disabled:

- MD-4 and MD-5 for signing
- MD-5 HMAC

Protocols

1. All SNMP operations must be performed within a secure IPSec tunnel.

Remote Access

1. Telnet access to the module is only allowed via a secure IPSec tunnel between the remote system and the module. The Crypto Officer must configure the module so that any remote connections via telnet are secured through IPSec.

2. SSH access to the module is only allowed if SSH is configured to use a FIPS-approved algorithm. The Crypto Officer must configure the module so that SSH uses only FIPS-approved algorithms.

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